BOTANY OF SOCOTRA.

Botany of Socotra. By Isaac Bayley Balfour, M.D., F.R.S., &c., assisted by other Botanists. Forming Vol. XXXI. of the Transactions of the Royal Society of Edinburgh. (Edinburgh: Grant and Son. London: Williams and Norgate. 1888.)

UNDER the auspices of the Royal Society of London and the British Association for the Advancement of Science, Dr. Bayley Balfour proceeded to Socotra early in 1880, accompanied by Mr. A. Scott, a gardener, and joined at Aden by Lieut. Cockburn, for the purpose of investigating the natural history of the island. Originally it was intended that Colonel Godwin-Austen should lead the Expedition, but circumstances prevented him; and the Committee, through Sir Joseph Hooker, thereupon requested Dr. Balfour—who had recently completed an account of the results of his botanical exploration of the Island of Rodriguez—to undertake the task. He had just been appointed to the Botanical Chair in the University of Glasgow, and the duties connected therewith demanded his presence after the middle of April, therefore the duration of the expedition was necessarily very limited, and the time actually spent on the island was little more than six weeks, ending on March 30. Nevertheless, the botanical collections included specimens of between five and six hundred species of Phanerogams, besides Cryptogams; though, as might be expected from the hasty manner in which the work had to be performed, and the short season during which the plants were collected, many of the specimens were imperfect. The following spring a party of German naturalists visited the island, among them the distinguished African traveller and botanist, Dr. Schweinfurth, to whom Dr. Balfour sent a catalogue of the plants he himself collected, with the gratifying result presently to be explained.

Fortunately the German Expedition entered upon its labours a fortnight later than the time when the British Expedition finished its work. Vegetation was then at a later stage of development; and Dr. Schweinfurth was able to supplement largely Dr. Balfour's botanical collections, especially in the direction of much more complete material. The unselfish devotion to science displayed by Dr. Schweinfurth is eulogized by Dr. Balfour in the following words:—

> "With a generosity which is as pleasing as it is rare, he subsequently sent his collections to me in England, in order that the whole flora might be worked out in one. I have already had opportunity to express publicly my lively appreciation of this act of friendship and self-abnegation, and I wish here to put the fact again on record, and to say how much Dr. Schweinfurth's specimens have contributed to the satisfactory working out of the details of the flora. The value of his collection must not be measured either by the number of the species, or by the species he found which we had not gathered. In the excellence of his specimens and their completeness, and the way in which they so frequently supplemented, in flower and fruit characters, deficiencies in ours—therein lay the value of Schweinfurth's plants, and I cannot appraise it too highly."

Dr. Balfour elaborated the joint collections at Kew, and it was announced in NATURE five years ago that he had completed the descriptive part; but delays in connection with the production of the plates, which need not be particularized, we are informed in the preface, prevented the issue of the volume until this year.

It is satisfactory, however, to be able to congratulate Dr. Balfour and the Royal Society of Edinburgh on the quality of the work now first presented to the public in a complete form. Although it may fall considerably short of being an account of all the plants that inhabit the island, it is sufficiently full to be of the utmost value to the student of systematical and geographical botany. Dr. Balfour's 521 pages of letterpress are illustrated by 100 plates, drawn by W. H. and J. N. Fitch, Mrs. Thiselton Dyer, and Miss M. Smith, though mainly by the latter lady. Apart from the descriptive matter, the geographical distribution of the individual species, and the affinities of the flora as a whole, are given in ample detail in the form of an introductory essay, which will rank high among recent contributions to phytogeography. There is also a map on a scale of about 1¼ inch to 5 miles, and a brief sketch of the position, physical features, and geology of the island.

Socotra is situated off the north-east corner of Africa, about 500 miles from the entrance to the Red Sea, between 12° and 13° N. lat., and 53° and 54° E. long. Its extreme length from east to west is about 72 miles, its breadth 20; and it is about 140 miles from the nearest point of the African coast, and a little more distant from the Arabian. The surface is mountainous, the interior averaging 1000 feet in altitude, with granite peaks exceeding 4000 feet. The main plateau is of limestone deeply cut into ravines and valleys. In some places the hills rise abruptly from the sea, in others there are intervening sand plains several miles in width. The climate is cooler and more humid than in the adjacent parts of Africa and Arabia, and in some parts there are perennial streams; but the character of the vegetation generally is that of a dry sterile country.

Out of 575 Phanerogams, or flowering plants, collected, 10, including the date and palmyra palms, orange, cotton, tamarind, and castor-oil, were undoubtedly planted, and many others weeds of wide dispersion; whilst 206 are apparently endemic; and there are 20 endemic genera. Unfortunately, as I think, Dr. Balfour has not deducted the certainly and probably introduced species in his analysis of the composition of the flora, hence his figures representing the percentages of endemic genera and species do not reveal the true facts. Thus he calculates that 36·5 per cent. of the species, and 6·3 per cent. of the genera, are endemic; and these are high percentages, considering the short distance the island is separated from the mainland, and indicate a very ancient flora; but had he eliminated the species in question, these percentages would have stood even higher. On the other hand, it is a mistake to say (Introduction, p. xlix) that the percentage of endemic species is about the same as in Madagascar, where the proportion of endemic genera is double that in the Socotra. The percentage of endemic species in the Madagascar flora is probably at least double that in the Socotran flora, and Mr. Barron, in a paper he recently read before the Linnean Society, estimated the endemic element at 80 per cent. of the species. In British India it is as high as 68 per cent.; in Mexico and Central America combined it reaches 70, and in the whole of Australia 80 per cent.

A comparison of the flora of Socotra with that of the

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Bermudas, which are more than three times the distance from the nearest mainland, will give some idea of the differences in the age of the two. The latter contains no endemic genus, and only about half a dozen species, and these are not of a highly differentiated character—one is a portion of a very old flora, and the other a flora of recent derivation. The small flora of Juan Fernandez (which lies about 400 miles from the coast of Chili) contains 21 per cent. of endemic genera and 78 per cent. of endemic species.

The endemic element in Socotra is distributed over fifty-four natural orders, and includes some highly curious types, such as *Cocculus Balfourii*, remarkable for its thick rigid cladodes and often leafless condition; *Thamnosma socotrana*, a member of a Mexican genus; *Dirachma*, a geraniaceous genus of American affinities; *Dendrosicyos*, unique in the Cucurbitaceæ for its arboreous character; *Trichocalyx*, a new genus of the Acanthaceæ; *Cockburnia*, a new genus of the almost exclusively African Selagineæ; and *Cœlocarpus*, a new genus of the Verbenaceæ, having strong American affinities. Of the 136 genera to which the endemic species belong, 98 are only known to be represented by endemic species; and of the 20 endemic genera, 18 are monotypic. The isolated types of American affinities are a repetition of what has also been observed in the fauna and flora of Madagascar.

In summing up, Dr. Balfour finds that the affinities of the flora are essentially tropical African and Asian, the former more pronounced. A former, though very ancient, land connection with Africa he regards as conclusively proved, and the evidence strongly favours the supposition that it was also united with Arabia. With regard to the element of strongest American affinity, its presence is still an unsolvable problem. W. B. H.

THE METALLURGY OF GOLD.

The Metallurgy of Gold; a Practical Treatise on the Metallurgical Treatment of Gold-bearing Ores. By M. Eissler. (London: Crosby Lockwood and Son, 1888.)

THE title suggests that this little volume is a more comprehensive treatise than the author has attempted to write, but it is nevertheless likely to be useful to a large class of readers.

There is a wide-spread belief that, as much of the gold in Nature is found in the "native" or metallic state, its metallurgy must be comparatively simple; and so it would be in nearly all cases if it were not for the fact that the precious metal often occurs in a very fine state of division, or in association with sulphides and tellurides of other metals. Ignorance as to the true nature of such ores has led to their being considered to be "base" or "rebellious," and has entailed much loss and disappointment.

It is asserted, on p. 5, that native gold is never quite pure, being almost invariably alloyed with silver; reference might, however, have been made to the interesting deposit of gold of exceptional purity recently discovered at Mount Morgan, in Australia.

The author points out that "the loss on working gold ores, even with our most modern appliances, is still enormous"; and he gives, among other statistical statements, the results of seven years' working in Colorado, where the average value of the precious metal in the ore, by assay, was £7 18*s*. per ton, while the amount actually extracted was only £3, showing a loss of over 60 per cent. A large section of the work is devoted to the consideration of methods of concentrating the free gold lost during crushing and amalgamating, and the processes for extracting the gold either by amalgamation or by chlorination. The author writes with a practical experience of the processes he describes, but his information is in many cases not up to date.

The illustrations are usually very clear, but in no instance is the scale on which they are drawn given, and there are too few references to the dimensions of the appliances described. The appearance of the illustrations often suggests that they have been borrowed from the trade circulars of the makers of mining machinery. It would surely have been possible to give a more intelligible section of a chlorination works than the one (p. 142) which was suitable enough for its purpose when it originally appeared as an incidental illustration to an Official Report to the United States Government published in 1873; and a far more useful drawing might have been found to accompany the description of the refining of gold by Miller's process than the diagrammatic one which was drawn eighteen years ago by the writer of the present review in order to make the nature of the process clear in an Official Memorandum.

More useful information than is to be found in the twenty-one pages devoted to assaying might easily have been condensed into them, and it is much to be regretted that no attempt has been made to deal with the treatment of tellurides, which are so troublesome to the smelter, and have occasioned so much loss. In a future edition it would also be well to give a description of the process of collecting the precious metals in lead, which plays so important a part in the smelting of complex auriferous ores of lead and copper. Hydraulic mining, also, should find a place. Certain defects of style will no doubt be corrected in a second edition; this will be welcome, for, although the work is hardly in sufficient detail to justify its being called a "practical treatise," it will be useful, especially to men who are engaged in smelting. The author suggests that it contains sufficiently full information for "investors and others interested in gold-mining operations who may wish to gain an intelligent insight into the *modus operandi* at the gold-mines." To them it may be warmly recommended, for, although the element of speculation can hardly be separated from genuine investment in gold-mines, the "adventurers," to use the old name, often deliberately neglect all investigation into the nature of the methods by which they hope to profit. W. C. ROBERTS-AUSTEN.

OUR BOOK SHELF.

Viaggio di L. Fea in Birmania e regioni vicini. II. "Primo saggio sui Ragni Birmani." Del Prof. T. Thorell. (Genova: Tipographia del R. Istituto Sordo-Muti, 1887.)

DR. THORELL deserves our best thanks for having begun a faunistic work on the spiders of Burmah; still greater would have been our gratitude had his minute and exhaustive descriptions been accompanied by figures of the numerous new species recorded. One of the greatest hindrances in the study of exotic araneology is the paucity of such works. The present, however, is not

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